TUNERS
Double-stub

MODELS
DS-109, DS-109L, DS-109LL

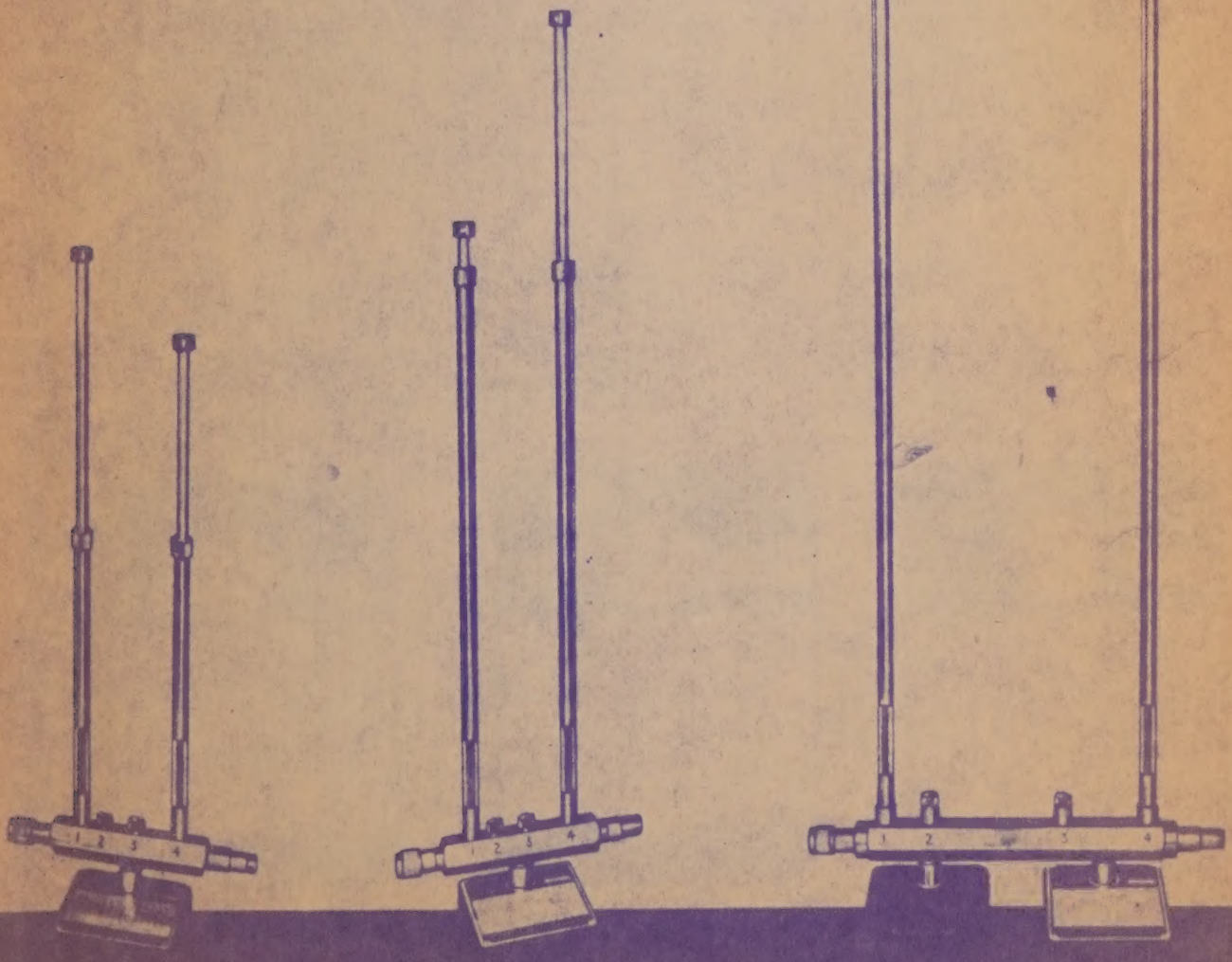
Scope of Use

These tuners are used as variable radio-frequency impedance transformers and can be used to match between a wide range of impedances. The most common use is to transform a load impedance to the impedance of a transmission line feeding the load so as to achieve a maximum transfer of power and maintain a low standing wave-ratio on the line. This is important when making power or attenuation measurements, since the assumption is usually made that the incident power is being measured and this is only correct if the power-measuring element absorbs all power incident on it.

Description

Two factors are important in the design of Weinschel Tuners:

1. **The range of impedances they will match**—*Determined primarily by the spacing between the stubs.*
2. **The ease with which adjustments can be made**—*This factor concerns the sensitivity of the adjustment and the convergence toward a matched*



Model DS-109 Model DS-109L Model DS-109LL

condition for successive adjustment of the two stubs when they are adjusted individually for a minimum VSWR.

Weinschel Tuners are provided with adjustable spacing between stubs, making it possible to set this spacing so that a converging condition results. This results in a minor restriction on the range of impedances that can be matched, but in those rare cases where the load impedance falls outside the range of the tuner, it can be brought into range by inserting a quarter wavelength line between the tuner and the load. The optimum spacings for specific operating frequencies are shown on large nameplates which are permanently attached to the heavy base of each tuner (see illustrations below).

Due to the excessive spacing available, these tuners are useful below their low-frequency limits; however, quick convergence is obtained by using recommended spacings.

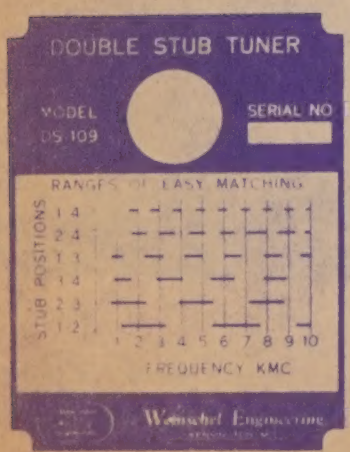
Another aid to ease of adjustment is the design of the stub. The sliding contacts are removed from the high-current point of the short, which reduces materially the noise produced when the short is in motion. These tuners are also provided with adjustable stands that permit convenient use with practically all commercial slotted lines.

The stubs are provided with collet-type locks to prevent accidental movement of the stubs after they have been adjusted.

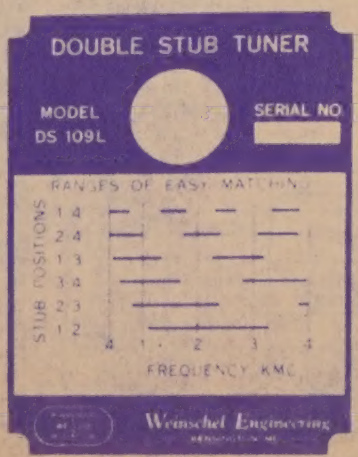
Please Order by Model Number

Model No.	DS-109	DS-109L	DS-109LL
Frequency Range, MCS	750-10,000	400-4000	200-2000
Impedance Match	See footnote		
Line Impedance	50 ohms		
Length of Stub Travel, cm.	20.5	38	76
Overall Length, in.	6⅛	6⅛	12
Overall Height, in.	12½ to 20¾	20½-35¼	36¼-66½
Connectors	One Male, one Female, Type N		
Height of Center Conductor, in.	2⅜ – 3¼		
Shipping Weight, lb.	5	6	12

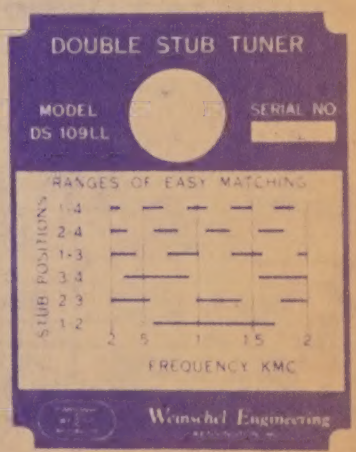
Any impedance greater than 50 ohms resulting in a VSWR of less than 7.0 can be matched to a 50-ohm line. Any impedance less than 50 ohms can be matched to a 50-ohm line within the specified frequency range. The tuners can be used at lower frequencies as explained above, but the range of matchable impedances will be more restricted.



Model DS-109



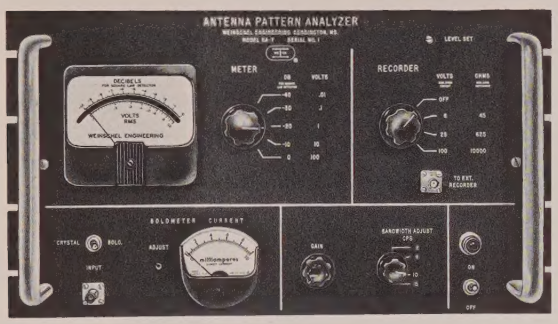
Model DS-109L



Model DS-109LL

NAMEPLATES

SHORT FORM CATALOG



Antenna Pattern Analyzer—Model BA-7

Maximum range of measurement in one step is 45 db (r.f.) using a maximum of 1 microwatt r.f. power.

The BA-7 is the heart of a video detector system designed primarily for r.f. crystals. For greater versatility, a d.c. biasing circuit is included to permit use of conventional barretters, requiring a d.c. bias between 0 and 10 ma. The unit can be used to measure very high power ratios such as occur in making antenna pattern measurements, to determine the rejection coefficients of r.f. filters, and to calibrate attenuators. It has a wide dynamic linear range, a low noise level and a wide r.f. frequency range where video crystal mounts are available.

For complete specifications, write for Bulletin No. 141.

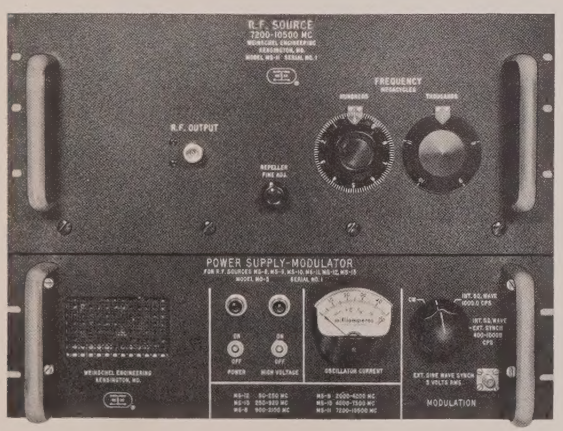
Square Wave Modulator—Model MO-1A

0.01% Frequency Stability (1000 CPS)

Used to 100% square wave modulate r.f. signal sources including klystrons. It is used where high stability is required for the audio frequency modulation of the r.f. signal.

This instrument features excellent amplitude and frequency stability, sine wave output, square wave output, external synchronization and adjustable internal oscillator.

For complete specifications, write for Bulletin No. 47.



Model MS-11 R. F. Source
With
Model MO-3 Power Supply

For Precision Microwave Measurements—Stable Sources of CW or 100% Square Wave Modulated R. F. Power

50 to 10,500 MC Models MS-8 to MS-13

All models plug into common power supply and modulator, Model MO-3 Amplitude stability for fixed load after 30 minutes warm-up: ±.02 db/minute; ±.1 db/hour. Stability of 1000 cps Modulator: .01% Frequency stability: MS-12 and MS-13: ±.1%; MS-8, MS-9, MS-10 and MS-11: 1 part in 10^4/ 8 hours, 1 part in 10^6 per 15 minutes.

Model Number	Frequency MCS	Minimum Power Output, CW	Minimum Peak Power Output (100% Square Wave Modulated)
MS-12	50-250	40 MW	40 MW
MS-13	250-920	100 MW	100 MW
MS-8	900-2200	20 MW	20 MW
MS-9	2100-4200	2100-2600 MC: 30 MW 2600-4200 MC: 50 MW	2100-2600 MC: 30 MW 2600-4200 MC: 50 MW
MS-10	4000-7300	50 MW	50 MW
MS-11	7200-10,500	7200-7400 MC: 20 MW 7400-9700 MC: 50 MW 9700-10,500 MC: 20 MW	7200-7400 MC: 20 MW 7400-9700 MC: 50 MW 9700-10,500 MC: 20 MW

For complete specifications, write for Bulletin No. 169.

WEINSCHEL ENGINEERING CO ®

Weinschel Engineering

10503 METROPOLITAN AVENUE • KENSINGTON, MARYLAND
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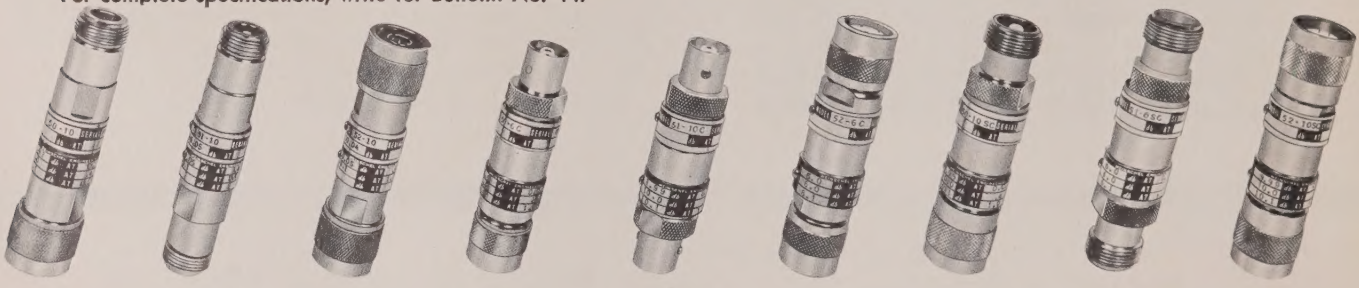
FIXED COAXIAL ATTENUATORS—D.C. TO 12.4 KMC

Our experience in making coaxial attenuators with our own stable film resistors since 1947 is your assurance of quality and long term repeatability.

Model 50 *D.C. to 1 KMC, Usable to 2 KMC*

50 Ohm • Attenuation: 1 to 50 db • Maximum Input VSWR: 1.15, Bilateral • Calibration and Test Data Supplied: Insertion loss at d.c., 400 and 1000 mc in 50 ohm system. VSWR for both connectors at 400 and 1000 mc when terminated in 50 ohms • Stability: Excellent shock and vibration resistance. Negligible change of attenuation under humidity and temperature cycling. Stable under pulse power. • Connectors: Type N, C or SC. Each type is available with male/female, double male or double female connectors. • Finish: Models 50, 51, 52 (Type N connectors), stainless steel; Models 50C, 51C, 52C (Type C connectors) and 50SC, 51SC, 52SC (Type SC connectors), nickel plated.

For complete specifications, write for Bulletin No. 44.



N Connectors 1 Male, 1 Female | N Connectors 2 Female | N Connectors 2 Male | C Connectors 1 Male, 1 Female | C Connectors 2 Female | C Connectors 2 Male | SC Connectors 1 Male, 1 Female | SC Connectors 2 Female | SC Connectors 2 Male

Model 10

10 Watt Power Pads

Frequency Range: D.C. to 1 KMC

50 Ohm

Attenuation 1 to 20 db

Connectors:

Type N, 1 male, 1 female Bilateral

Maximum Input VSWR: 1.15

Power Sensitivity: Less than .1 db/10 watts

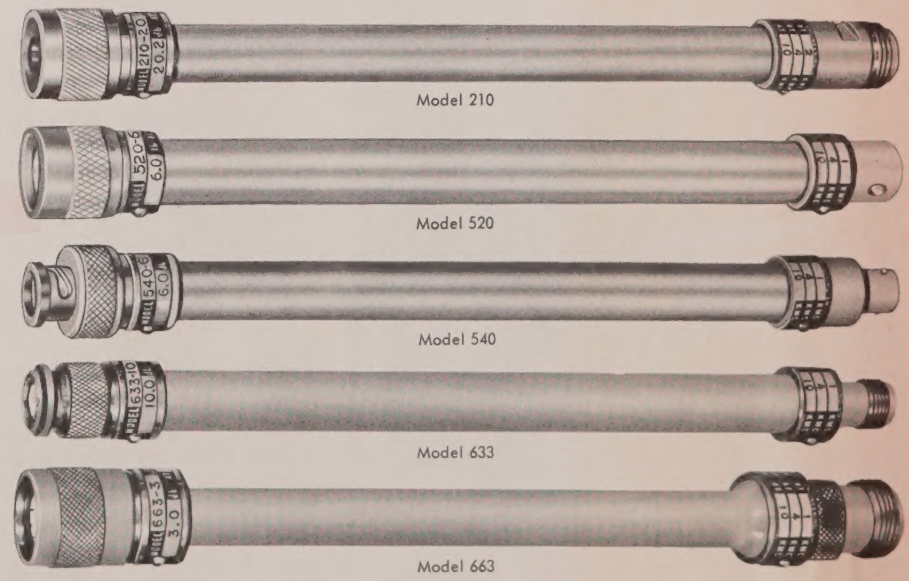
Calibration Frequencies: D.C., 400 mc, 750 mc, 1000 mc

Finish: Stainless steel connectors; black anodized aluminum body

For complete specifications, write for Bulletin No. 27.

Models 210, 520, 540, 633 and 663 *1 to 12.4 KMC*

50 Ohm • Attenuation: 1 to 20 db • Connectors: Type N, C, BNC, TNC or SC. Each is available with male/female, double male or double female connectors. • Calibration Data Supplied: Insertion loss in 50 ohm system at 1, 4 and 10 KMC to nearest 0.1 db (2 KMC instead of 1 KMC for 20 db attenuator) • Stability: Excellent shock and vibration resistance. • Negligible change of attenuation under humidity and temperature cycling or pulse power. • Finish: Models 210, 211, 212 (Type N connectors), stainless steel; other models (Type C, BNC, TNC and SC connectors), nickel plated.



Model 210

Model 520

Model 540

Model 633

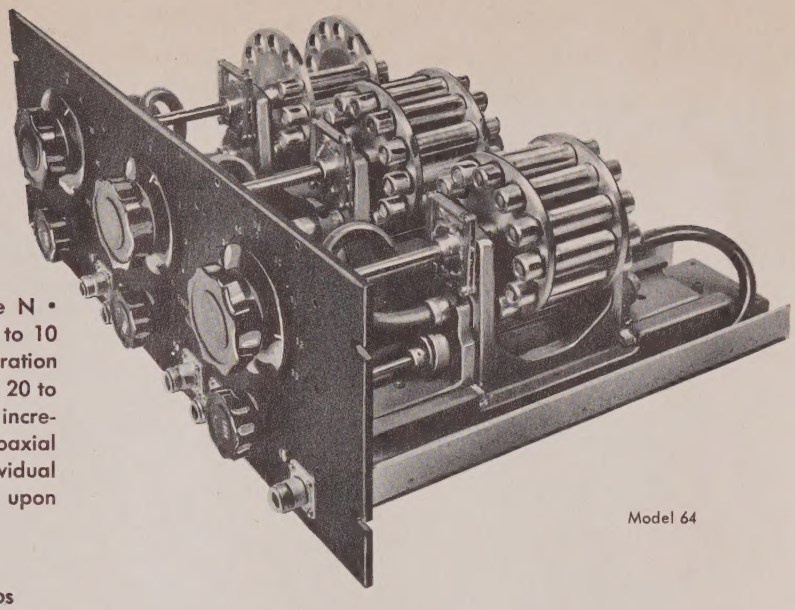
Model 663

ORDER BY MODEL NUMBER

Connectors	Type N	Type C	Type BNC	Type TNC	Type SC
1 Male 1 Female	210	520	540	633	663
2 Female	211	521	541	634	664
2 Male	212	522	542	635	665

For complete specifications, write for Bulletin No. 17.

Step Attenuators—
Models 60, 64, 640—
For Use in Standards Labs



Model 64

D.C. to 1 KMC

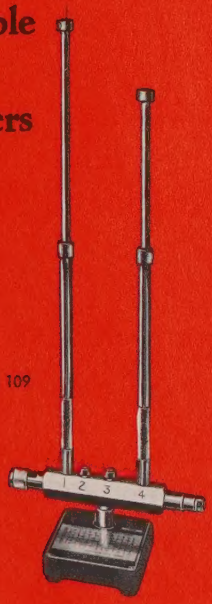
Impedance: 50 Ohm • Connectors: Type N • Accuracy (at D.C.): 1 to 5 db: .02 db; 6 to 10 db: .05 db; 20 to 50 db: .10 db • RF Calibration Accuracy (since 1960): 1 to 10 db: .02 db; 20 to 50 db: .02 db/10 db. • Repeatability of incremental insertion loss due to stability of coaxial switches within .01 db. • We supply individual calibration at D.C., 400 and 1000 mc and upon request at other frequencies.

Attenuation Range:

Model 60: 2 drums, 0-60 db in 1 db steps
Model 64: 3 drums, 0-64 db in .1 db steps
Model 640: 3 drums, 0-110 db in 1 db steps

For complete specifications, write for Bulletin No. 37.

Double Stub Tuners



Model DS 109

Chart on base for easy matching
Collet-type locks prevent accidental movement of stubs
Adjustable spacing between stubs
Adjustable height of connectors

Frequency Ranges

DS 109 .75 to 10 KMC
DS 109L .4 to 4 KMC
DS 109LL .2 to 2 KMC

For complete specifications, write for Bulletin No. 19.

535-MN 535-MC 535-MSC 535-MB 535-MT

535-FN 535-FC 535-FSC 535-FB 535-FT

Coaxial Terminations—Model 535

D.C. to 10 KMC; 50 Ohm

Connectors: N, C, SC, BNC, TNC

Individual VSWR Calibrations Supplied at Seven Frequencies: d.c., .4, 1, 2, 4, 7.5 and 10 KMC. Other frequencies upon request.

Made with Weinschel film resistors for maximum stability; rated 1watt average, 1 KW peak power.

Maximum VSWR of Model 535 with Male or Female Type N Connector:

D.C. to 1 KMC:	1.03
1 to 4 KMC:	1.05
4 to 10 KMC:	1.15

For complete specifications, write for Bulletin No. 46.

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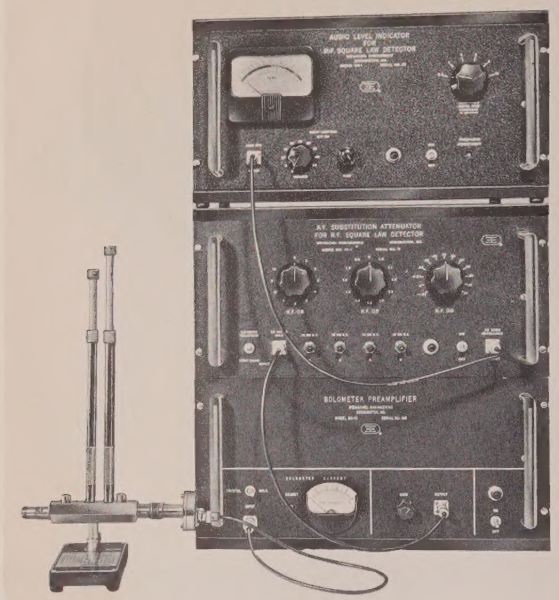
INSERTION LOSS MEASURING EQUIPMENT



Single Channel Insertion Loss Test Set

Measure attenuation directly up to 30 db
Typical systems error: .1 db
Resolution: about .02 db
Frequency Range: 20 mcs to 90,000 mcs

KEY INSTRUMENTS

Bolometer Preamplifier, Model BA-1C:
Features wide dynamic linear range, extremely low noise level, cannot burn out barretter; can also be used with crystal.*

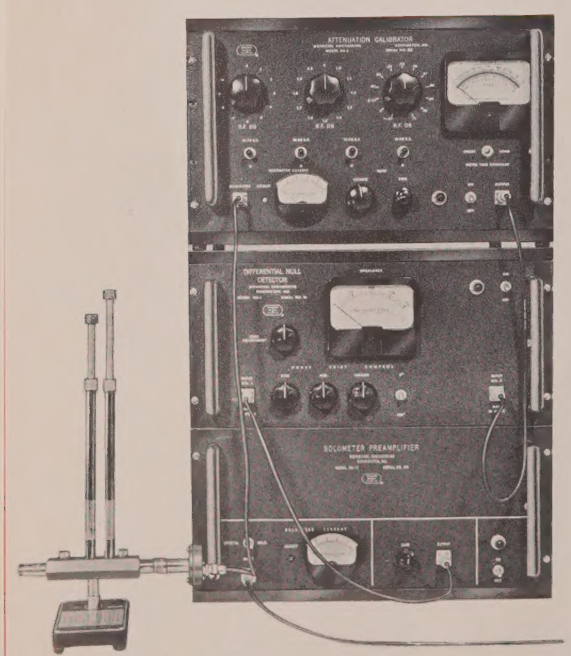
AF Substitution Attenuator for RF Square Law Detector, Model CF-1:
Calibrated directly in r.f. power ratios; has high input impedance, low output impedance.

Audio Level Indicator, Model IN-1:
Precharging circuit reduces required observation time. Has adjustable indicator time constant, low noise level.

For theory, method, required instruments and recommended accessories, write for Weinschel Engineering Application Note No. 1.

*Write for reprint of paper "Comparison of Deviations from Square Law for RF Crystal Diodes and Barretters."

Dual Channel Insertion Loss Test Set—For Standards Labs



.01 db precision for 20 db measurement
With changes of .1 db in level of r.f. source
Typical Systems Accuracy: .02 db/10 db
Attenuation Range: 20 db, direct; 40 db with partial r.f. substitution
Frequency Range: 20 mcs to 90,000 mcs

KEY INSTRUMENTS

Attenuation Calibrator, Model BA-5:
Combines precise Audio Substitution Attenuator, Bolometer Preamplifier and Level Indicator.

Differential Null Detector, Model ND-1:
Specifically designed for two channel loss measurements.

Bolometer Preamplifier, Model BA-1C:
Features wide, dynamic linear range, extremely low noise level, cannot burn out barretter.

For theory, method, required instruments and recommended accessories, write for Weinschel Engineering Application Note No. 4.

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186R-5/60

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